In re Patent Application of:
AMMAR
Serial No. **09/863,030**
Filing Date: **May 22, 2001**
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In the Claims:

1. (TWICE AMENDED) A thick film millimeter wave transceiver module comprising:

base plate;

a multi-layer, thick film substrate board formed from a plurality of ~~layers~~ planar sheets of low temperature co-fired ceramic material stacked together to form a single, planar substrate board having a planar bottom surface and planar top surface, and received on said base plate and a plurality of MMIC chips directly attached to the top surface of the substrate board and operable to transmit and receive millimeter wavelength signals, said substrate board ~~layers~~ comprising ~~at least one of~~

a DC signals layer formed from a separate sheet and having signal tracks and connections;

a ground layer formed from a separate sheet and having ground connections;

a device layer formed from a separate sheet and having capacitors and resistors embedded therein that connect to MMIC chips;

a ~~top layer~~ planar sheet of low temperature co-fired ceramic material positioned at the top surface of the substrate board and having cutouts for receiving the MMIC chips therein;

~~a solder preform layer located between said device layer and said top layer for securing any MMIC chips;~~ and

a channelization plate received over the ~~multi-layer~~ top surface of the substrate board and having channels formed

to receive the MMIC chips and provide air isolation between transmit and receive signals.

2. (original) A thick film millimeter wave transceiver module according to Claim 1, and further comprising isolation vias which extend through multiple layers down to the ground layer.

3. (original) A thick film millimeter wave transceiver module according to Claim 1, and further comprising a radio frequency cover received over said channelization plate.

4. (original) A thick film millimeter wave transceiver module according to Claim 1, wherein each of said layers within said multi-layer substrate board is about 2 to about 4 mil thick.

5. (original) A thick film millimeter wave transceiver module according to Claim 4, wherein said layers are about 3 mil thick.

6. (original) A thick film millimeter wave transceiver module according to Claim 5, wherein said top layer is about 4 mil thick.

7. (original) A thick film millimeter wave transceiver module according to Claim 1, wherein said base plate is formed from a CTE matched material.

8. (original) A thick film millimeter wave transceiver module according to Claim 1, wherein said base plate is about 0.1 to about 0.3 inches thick.

9. (original) A thick film millimeter wave transceiver module according to Claim 8, wherein said base plate is about 0.125 inches thick.

10. (TWICE AMENDED) A multi-layer thick film substrate board used in millimeter wave transceiver modules comprising:

a plurality of planar sheets of low temperature transfer tape ~~layers~~ stacked together to form a single, planar substrate board having a planar bottom surface and planar top surface on which a plurality of MMIC chips are mounted and operable to transmit and receive millimeter wavelength signals, ~~said layers~~ and comprising ~~one of at least~~:

a DC signals layer formed from a separate sheet and having embedded DC signal tracks and connections;

a ground layer formed from a separate sheet having ground connections; and

a device layer formed from a separate sheet having capacitors and resistors embedded therein that connect to MMIC chips.

~~a top layer having cut-outs that receives MMIC chips therein; and~~

~~a solder preform layer located between said device layer and said top layer for securing any MMIC chips received within the cut-outs of the top layer.~~

11. (original) A multi-layer thick film substrate board according to Claim 10, and further comprising isolation vias which extend through multiple layers down to the ground layer.

12. (original) A substrate board according to Claim 10, wherein each of said layers within said multi-layer substrate board is about 1 to about 4 mil thick.

13. (original) A substrate board according to Claim 12, wherein said layers are about 3 mil thick.

14. (original) A substrate board according to Claim 10, wherein said top layer is about 4 mil thick.

15. (original) A substrate board according to Claim 10, wherein said base plate is formed from a CTE matched material.

16. (TWICE AMENDED) A thick film millimeter wave transceiver module comprising:

base plate;

a multi-layer, thick film substrate board received on said base plate and formed from a plurality of ~~layers~~ planar sheets of low temperature co-fired ceramic material stacked together to form a single planar substrate board having a planar bottom surface and planar top surface, said layers comprising ~~one of at least~~

a DC signals layer formed from a separate sheet and having embedded DC signal tracks and connections;

a ground layer formed from a separate sheet having ground connections;

a device layer formed from a separate sheet having capacitors and resistors embedded therein;

a ~~top layer~~ sheet having cut-outs secured at the top surface for receiving MMIC chips;

~~a solder preform layer located between the device layer and top layer;~~

~~at least one~~ a plurality of MMIC chips surface mounted ~~received~~ on the top surface ~~solder preform layer and secured by a solder connection thereto~~ and operatively connected to said ~~layers, including said embedded DC signal tracks and connections and capacitors and resistors embedded in the device layer~~ DC signals, ground and capacitors and resistors and operable to transmit and receive millimeter wavelength signals; and

a channelization plate received over the formed multi-layer substrate board and having channels formed to receive MMIC chips and provide air isolation between transmit and receive signals.

17. (original) A thick film millimeter wave transceiver module according to Claim 16, and further comprising isolation vias which extend through multiple layers down to the ground layer.

18. (ONCE AMENDED) A thick film millimeter wave transceiver module according to Claim 16, and further comprising a solder preform layer for securing the plurality of ~~at least one~~ MMIC chips to said substrate board.

19. (ONCE AMENDED) A thick film millimeter wave transceiver module according to Claim 16, and further comprising a silver epoxy securing the plurality of ~~at least one~~ MMIC chips to the substrate board.

20. (original) A thick film millimeter wave transceiver module according to Claim 16, and further comprising a radio frequency cover received over said channelization plate.

21. (original) A thick film millimeter wave transceiver module according to Claim 16, wherein each of said layers within said multi-layer substrate board is about 2 to about 4 mil thick.

22. (original) A thick film millimeter wave transceiver module according to Claim 21, wherein said layers are about 3 mil thick.

23. (original) A thick film millimeter wave transceiver module according to Claim 16, wherein said base plate is formed from a CTE matched material.

24. (original) A thick film millimeter wave transceiver module according to Claim 23, wherein said base plate is about 0.1 to about 0.3 inches thick.

25. (original) A thick film millimeter wave transceiver module according to Claim 24, wherein said base plate is about 0.125 inches thick.

26. (TWICE AMENDED) A method of forming a thick film millimeter wave transceiver module comprising the steps of:

forming a base plate;

forming a thick film, multi-layer substrate board by stacking ~~from~~ a plurality of ~~layers~~ planar sheets of low temperature co-fired ceramic material to form a single planar substrate board having a planar bottom surface and planar top surface on which MMIC chips are mounted and operable to transmit and receive millimeter wavelength RF signals;

receiving the thick film, multi-layer substrate board on the base plate, wherein the substrate board comprises ~~one of at least~~

a DC signals layer formed from a separate sheet and having signal tracks and connections;

a ground layer formed from a separate sheet having ground connections;

a device layer formed from a separate sheet having capacitors and resistors embedded therein; and

~~a top layer having cutouts for receiving MMIC chips therein; and~~

securing the MMIC chips ~~by solder~~ onto the top surface of the thick film multi-layer substrate board such that ~~and operatively connecting~~ the MMIC chip operatively connects to capacitors and resistors embedded within the

device layer and other layers via interconnects within the thick film substrate board.